



The Contaminant Analysis Automation (CAA) Program



Figure 1. A cutaway of the Los Alamos-designed mobile laboratory used in on-site analysis.

The CAA Program is one coordination area of the Robotics Technology Development Program (RTDP) within the Department of Energy's (DOE) Office Of Technology Development. The cross-cutting automated technology developed by this program is directly applicable to the following focus areas:

- Landfill stabilization
- Contaminant plume containment and remediation
- Mixed waste characterization, treatment, and disposal

The CAA team's primary thrust is to promote the development and commercialization of technologies necessary for the automation of the DOE and private contract environmental laboratories. This effort is in direct response to the growing need for chemical characterization of soil samples, contents of storage tanks, water samples, and other sample matrices that must take place before remediation can be initiated.

The DOE has significant amounts of radioactive and hazardous wastes stored, buried, and still being generated at many sites within the United States. These wastes must be chemically characterized to determine the elemental, isotopic, and

compound content before remediation can begin. It is projected that sampling requirements will necessitate generating more than 10 million samples by the end of 1995, which will exceed the capabilities of current, manually driven chemical analysis laboratories.

Our ability to apply production automation concepts to environmental analytical analysis is currently very limited. Only by the application of standardized production chemistry techniques will we be able to provide those responsible for remediation of our government's hazardous waste sites with the knowledge necessary to accomplish the cleanup accurately, expeditiously, and safely. Tightening regulatory requirements will also have an impact by increasing sampling and analysis needs. The CAA Program has as its mission the development of technology to address our nation's current and future sample analysis needs by the application of the CAA Program's new robotic paradigm for analytical chemistry. By designing and transferring to industry automated instruments and systems, based upon the Standard Laboratory Module (SLM™) architecture, the CAA team is making significant progress towards automation of the environmental analysis laboratory.

Today, no automated commercial systems are available to automate these laboratories.

Initial market surveys revealed that modular and standardized software control and hardware are needed if these automated systems are to have the throughput, the reliability, and the transportability required.

Another factor leading toward the modularity concept is the need for systems that are standardized so that they can be operated by a technician not versed in environmental chemistry. To provide valid data and timely sample analysis results, the CAA team realized that it is necessary to harden these systems so that they can be transported to and operated directly at the remediation site. The concept of on-site sample analysis using CAA technology is shown in Figure 1.

The CAA team has made substantial progress over the past year towards its goal of automating the environmental analytical laboratory under a standardized and modular paradigm known as the Standard Analysis Method (SAM). This diverse and talented team, composed of five DOE national laboratories, three respected universities, and several private industrial partners, has developed and validated the initial technology necessary to demonstrate this new automation paradigm to a generally risk-averse and conservative laboratory culture. To date, a suite of 14 SLMs™, the backbone of this integrated technology, has been designed, developed, and validated. Also, a detailed survey of the environmental market and its needs was commissioned to help focus and prioritize the development. CAA is now working with private industrial partners to further develop the SAM System architecture and standards while aiding the commercialization of these instruments.

The DOE laboratories involved in the CAA effort include Pacific Northwest Laboratory, Idaho National Engineering Laboratory, Sandia National Laboratories, Oak Ridge National Laboratory, with Los Alamos National Laboratory as the coordinating laboratory. The participating CAA team member universities are the Universities of Texas, Tennessee, and Florida.

The team has made a commitment to commercialize standardized technology to ensure broad market availability, low cost, and reliability. To accomplish this commercialization the team has structured a technology transfer plan that hinges on

the critical role of the systems integrator. SciBus Analytical, Inc., a progressive automation and systems integration engineering company in Sunnyvale, California, has been named the systems integrator for the CAA team. SciBus engineers have over 500 years of collective electromechanical design experience and have applied a dedicated project management and design team to coordinate all aspects of CAA project development. The contracting mechanism for this interaction is a joint Cooperative Research and Development Agreement with the CAA national laboratories.

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